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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/584,987	06/29/2006	Michael Pontoppidan	06-459	7787
20306 7590 05/22/2009 MCDONNELL BOEHNEN HULBERT & BERGHOFF LLP 300 S. WACKER DRIVE 32ND FLOOR CHICAGO, IL 60606				
EXAMINER HAMAOUT, DAVID E				
ART UNIT		PAPER NUMBER		
3747				
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary

Application No.

10/584,987

Applicant(s)

PONTOPPIDAN, MICHAEL

Examiner

DAVID HAMAOU

Art Unit

3747

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 20 December 2007.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 9-11 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 9-11 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 29 June 2006 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-8508)
Paper No(s)/Mail Date 10/5/06

- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date _____
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____

DETAILED ACTION

Claim Rejections - 35 USC § 112

1. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

2. **Claims 9 – 11 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.**

3. In re claim 9, the following limitations are unclear:

- “a jet injection axis and with a jet diffuser angle”

Specifically, it is unclear from the claim limitations how this axis is situated. Furthermore, it is unclear how the diffuser angle is situated with respect to the jet injection axis. For purposes of examination this limitation will be interpreted as best understood by Examiner, wherein the jet injection axis is an axis passing from the point from which fuel exits the fuel injector through the center of the fuel spray, and the diffuser angle is the complete angle of the fuel spray and is bisected by the jet injection axis. For clarity, the *jet injection axis* will herein be referred to as the *fuel spray central axis*.

- “a first diametral plane containing said longitudinal axis of the cylinder **and centered on said exhaust port**”

Specifically, it is unclear how a plane can be centered on anything. For purposes of examination this limitation will be interpreted as best understood by Examiner, as “...and passes through the center of the exhaust port”.

- “a transverse plane of said cylinder”

Specifically, it is unclear to what this plane has a transverse relationship. For purposes of examination this limitation will be interpreted as best understood by Examiner, as being situated like plane T in figure 1.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. **Claims 9 – 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Pontoppidan (WO 02/086310 A1) in view of Kubo (US 2002/0195079) in view of J. E. Witzky et al. (US 3,154,059).**

6. In re claim 9, Pontoppidan ('310) discloses (fig 1) a direct-injection two-stroke engine having a cubic capacity of 125 cc at most, and a combustion chamber delimited by:

- a cylinder having a longitudinal axis (X), at least one inlet port (12) and at least one exhaust port (14),
- a piston (3) having a substantially flat crown moved along the longitudinal axis by a connecting rod connected to a crankshaft; and
- a cylinder head (16) provided with a spark plug (20) and an injector (22) adapted to spray a jet of liquid fuel under pressure into said combustion chamber along a fuel spray central axis and with a jet diffuser angle;
- wherein said combustion chamber has a first diametral plane containing said longitudinal axis of the cylinder and centered on said exhaust port and a second diametral plane perpendicular to said first diametral plane,
- said injector is disposed in a bore in said cylinder head oriented along a determined axis and in said first diametral plane in a second portion of the cylinder head complementary to said first portion, and
- said fuel spray central axis is at a first angle α from 30° to 70° to a transverse plane of said cylinder

- wherein said jet injection axis is at a non-zero angle δ to said cylinder head bore determined axis,
- wherein a control system is adapted to command the commencement of injection of fuel.

7. Regarding the limitations:

- *wherein a control system is adapted to command the commencement of injection of fuel when said crankshaft is at an angular position from 45° to 20° ahead of the angular position of closure of said exhaust port, and*
- *wherein the fuel injection pressure and the orientation of said jet injection axis are determined as a function of the flow of the gases in said combustion chamber to obtain a substantially stoichiometric air/fuel mixture in the region of said sparkplug at the moment of ignition.*

These limitations comprise functional language only and have only been given patentable weight only in how they materially alter or add structure to the apparatus of the claims. See MPEP 2144. The prior art need only **be able** to perform these functions in order to anticipate the claimed invention. It is clear that the system of Pontoppidan ('310) **could be** operated in the claimed manner if desired.

8. Pontoppidan ('310) lacks:

- a jet diffuser angle γ from 15° to 75°, and
- wherein the spark plug is in a first portion of said cylinder head extending from the second diametral plane towards said inlet port.
- wherein the fuel spray central axis is at a second angle β from +45° to -45° to said first diametral plane.

9. Kubo discloses (fig 6) an engine system comprising a fuel injector providing a fuel spray central axis that is at a non zero angle with the longitudinal axis of the bore in which the fuel injector lies; and discusses the optimization of the jet diffuser angle [0036].

10. It would have been obvious to one of ordinary skill in the art to modify the fuel injection system of Pontoppidan such that the fuel spray central axis that is at a non zero angle with the longitudinal axis of the bore in which the fuel injector lies as taught by Kubo as it is a known technique and thus within the capability of one having ordinary skill.

11. As to the specific limitation of the claimed jet diffuser angle (15° to 75°), it further would have been obvious to one having ordinary skill in the art at the time the invention was made to provide the claimed jet diffuser angle (15° to 75°), since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. In re Aller, 105 USPQ 233.

12. Witzky discloses an engine system comprising a fuel injector that provides a fuel spray central axis that is angled (fig 2; B) in a manner analogous to Applicant's angle β , and wherein the angle B is approximately 30° (col 4, ln 58 – 68). This is within the range from $+45^{\circ}$ to -45° . Furthermore, Witzky discloses an angled spark plug (fig 1; 20) placed in a non-central portion of the cylinder head. While it is noted that there are other parameters of the fuel spray and general system that are not analogous to Applicant's claimed invention, it is clear from the disclosure of Witzky that the notion of angling the fuel spray central axis with respect to all major axes of the system has been contemplated by the prior art. Likewise for the angling and placement of the spark plug.

13. Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the system of Pontoppidan ('310) by angling the fuel spray central axis and positioning the spark plug, as taught by Witzky, as they are known techniques and thus within the capability of one having ordinary skill.

14. In re claims 10 and 11, these limitations comprise functional language and have been treated in the manner as set forth in paragraph 7 above. Furthermore, these limitations describe the optimization of known result-yielding parameters (see above; paragraph 11).

Conclusion

15. See PTO-892: Notice of References Cited.

Contact

Any inquiry concerning this communication or earlier communications from the examiner should be directed to DAVID HAMAQUI whose telephone number is 571-270-5625. The examiner can normally be reached on Monday - Friday, 7:30am - 5:00pm EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Stephen Cronin can be reached on 571-272-4536. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/DAVID HAMAQUI/
Examiner, Art Unit 3747

/Stephen K. Cronin/
Supervisory Patent Examiner, Art Unit 3747